Advant® OCS

Intrinsic Safety Support
S100 I/O with Series 1000

User's Guide

3BSE 008 431R101 Rev A

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WARNING	Hazards which could result in personal injury
CAUTION	Hazards which could result in equipment or property damage
NOTE	Alerts user to pertinent facts and conditions

Although **DANGER** and **WARNING** hazards are related to personal injury, and **CAUTION** hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, comply fully with all **DANGER**, **WARNING**, and **CAUTION** notices.

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Chapter 1 Introduction

1.1 General Information

The solution for Intrinsic Safety (I.S.) Systems described in this document is aimed for the Advant Controller 400 Series with Master software. The basic principle is to replace the connection units of the S100 I/O-system with termination boards housing the I.S. Isolator modules.

The Advant Controller 400 Series and the Intrinsic Safety System are always delivered in separate cabinets and can be considered as two systems working together. Connections between the cabinets are done with standard cables.

This document describes how to use Advant Controller 400 Series together with Intrinsic Safety System Series 1000 from ELCON Instruments.

For description of Advant Controller 400 and Intrinsic Safety System Series 1000 from ELCON Instruments see document according to the document list in Section 1.5 Related Documentation.

1.2 Equipment Requirements

Not applicable.

1.3 Manual Organization

Figure 1-1 shows the basic structure of the Advant System's various documentation. Each document, whether it is describing and referencing hardware or software, is built around this one structure making it easy to locate related information in any of the documents. Since this one structure is not completely applicable to both hardware and software, certain sections contain only very brief statements in some documents.

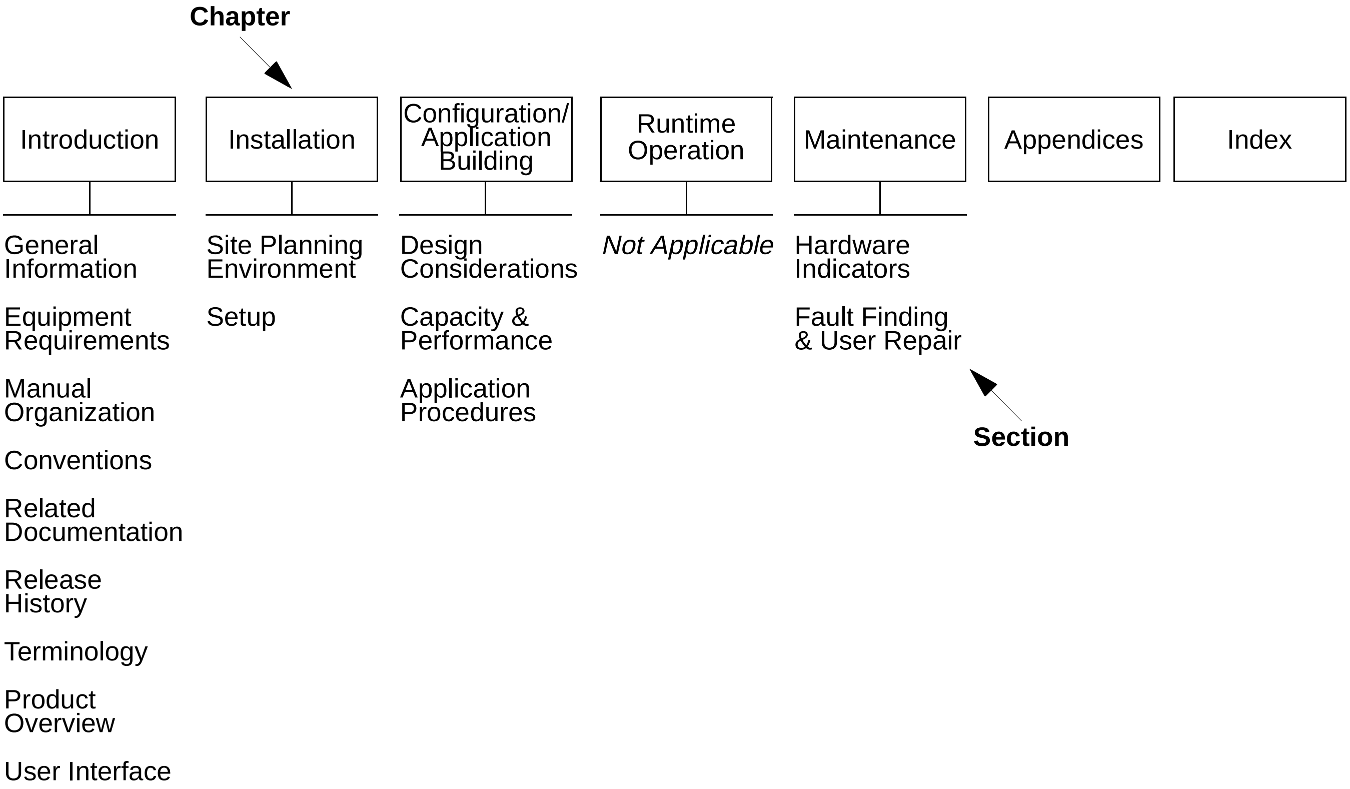

Figure 1-1. Basic Documentation Structure

1.4 Conventions

Not applicable.

1.5 Related Documentation

This manual only describes the combination of Advant Controller 400 Series and Intrinsic Safety System Series 1000 and refers to other documentation in questions concerning Advant Controller 400 Series and Intrinsic Safety System Series 1000.

Table 1-1. Related Documentation

Document	Description
Advant OCS Product Guide with Master Software	General description and ordering information for ABB Master
Advant Controller 410 User´s Guide	Description for Advant Controller 410
Advant Controller 450 User´s Guide	Description for Advant Controller 450
S100 I/O Hardware Reference Manual	Describes the hardware involved in the process interface S100 I/O
ELCON Instruments General Catalog	General description of ELCON Instruments Intrinsic Safety System
Ex i Isolators Series 1000 Manuals	Description of Intrinsic Safety Isolator modules and Termination Boards

1.6 Release History

The function is introduced in Advant Controller 400 Series:
Master version 1.1

1.7 Terminology

S100 I/O

S100 I/O is the group of input and output boards located in the I/O subrack (centralized I/O).

AC 400

Advant Controller 400 Series.

I.S.

I.S., Intrinsic Safety

1.8 Product Overview

The Advant Controller 400 Series and the Intrinsic Safety System Series 1000 are always delivered in separate cabinets. Connections between the cabinets are done with standard cables.

Figure 1-2 shows the conceptual structure for Advant Controller 400 Series together with ELCON Instruments Intrinsic Safety System Series 1000. An Intrinsic Safety System consists of a termination board, I.S. Isolator modules and an interface adapter card.

The Intrinsic Safety system is transparent both for system and application software in Advant Controller 400 Series.

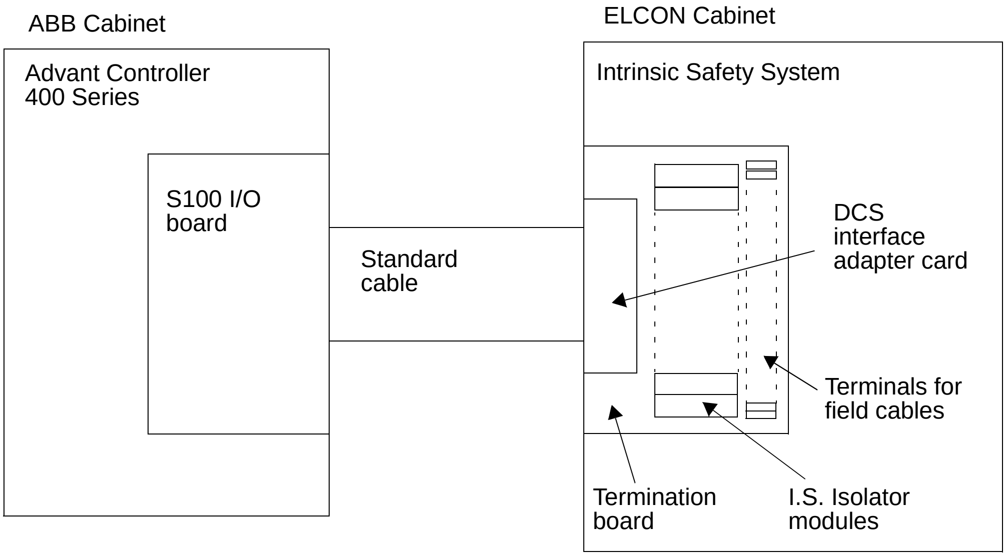

Figure 1-2. Conceptual Structure for Advant Controller 400 Series together with ELCON Instruments Intrinsic Safety System

1.8.1 S100 I/O

The S100 I/O consists of several I/O boards and cables covering a wide variety of applications. For this application only a selection of the S100 I/O boards and cables is used.

The cables that connect the cabinets are prefabricated round screened ribbon cables with connectors and with a length up to 15 m.

The S100 I/O boards and the cables are ordered as a set including I/O board and cable.

1.8.2 Termination Board

All Series 1000 I.S. Galvanically Isolated Barriers have to be plugged into an ELCON Series 1000 Termination Board.

The Termination Board is supplied on a metallic chassis that can be grounded by means of a dedicated GND Stud and guarantees an IP20 degree of protection.

The Board is available in two sizes for 8 and 16 I. S. modules each in two versions with and without Cross Wiring Terminals.

Additionally the “16-position” Termination Board (no Cross-wiring version) can be delivered with an extra connector suitable for the ELCON Series 1700 Hart Signal Multiplexer module.

All boards provide blue Terminals on the field side for field cable conductors up to 12 AWG (2.5 mm^2) and a connector for the ABB Interface Adapter Cards on the system side.

A 24 V d.c. supply bus is included on every board.

Following is a description of the Termination Boards suitable for the DCS Interface Adapter Card.

1216/TB-CON1-DS	16 module. Terminals on hazardous area, connectors suitable for DCS I.A.C.'s on the safe area without Cross wiring terminals. Size 187 x 535 mm (7.40" x 21.06")
1216/CW-CON3-DS	16 modules. Terminals on hazardous area, connectors suitable for DCS I.A.C.'s on the safe area with Cross Wiring Terminals. Size 239 x 535 mm (9.40" x 21.06")
1216/TB-CON5-H-DS	16 modules. Terminals on hazardous area, connectors suitable for DCS I.A.C.'s on the safe area with Connector for 1700 Multiplexer module, without Cross wiring terminals. Size 187 x 580 mm (7.40" x 22.8")
1208/TB-BA1	8 modules. Terminals on hazardous area, connectors suitable for DCS I.A.C.'s on the safe area without Cross wiring terminals. Size 187 x 282 mm (7.40" x 11.2")

For more detailed information see *ELCON Instruments documentation*.

1.8.3 Intrinsic Safety Isolator Modules

The Intrinsic Safety isolator modules (I.S. Isolator modules) are an ELCON Instruments standard product. There are modules for, for example. digital input, digital output, analog input, analog output, thermocouple input, RTD input and pulse counting up two 10kHz. Each type of modules exist in two versions; one or two channel modules (pulse counting over 2kHz only one channel). For more detailed information see *ELCON Instruments documentation*.

1.8.4 DCS Interface Adapter Card

The DCS Interface Adapter Card (I.A.C.) is an adaptation of the termination board to S100 I/O. It contains only an interconnection between two connection interfaces. The I.A.C. accepts on a termination board both single or dual channels I.S. Isolator modules.
The I.A.C. is delivered by ELCON Instruments.

1.8.5 Supported Signal Types

The signal type and signal range is determined by selection of the I.S. Isolator module.

The following signal types are among other types supported by ELCON I.S. Isolator modules series 1000, for more detailed information see *ELCON catalog*:

• Analog input:	0-5 mV up to 0-100mV, -10 to 80mV, 0 -1 V up to 0- 5 V, 1-5V, 0-10/20/40mA, 4 - 12/20 mA, 2/10-50mA, 12-20 mA, 20-4mA
• Analog output:	0 - 20 mA, 4 - 20 mA
• Thermocouple input:	Type B, E, J, K, R, S, T (linearization must be done in the Controller application program)
• RTD or Pot input:	3 wire Pt 100, 50 Ω,...10 kΩ
• Strain gauge	
• Digital input:	Contact, proximity switch, magnetic pick-up
• Digital output:	Solenoid valve driver, contact actuator
• Pulse counting:	Max 10 kHz

1.8.6 Supported S100 I/O Boards

Interface Adapter Card available for following S100 I/O boards:

Table 1-2. Available Adapter Boards

Boards	Description
DSAI 130	16 AI channels, resolution 12 bit
DSAI 133	32 AI channels, resolution 12 bit, redundancy possible
DSAX 110	8 AI + 8 AO channels, resolution 12 bit, redundancy possible
DSAO 120	8 AO channels, resolution 12 bit
DSDI 110A	32 DI channels
DSDI 115	32 DI channels
DSDO 110	32 DO channels
DSDO 115	32 DO channels
DSDP 110	28 pulse counting channels max 40 Hz
DSDP 150	12 pulse counting channels max 10 kHz

It is possible to use both single or dual channel I.S. Isolator modules. In redundant configurations (DSAI 133, DSAX 110) and pulse counting over 2 kHz, only single channel modules, can be used.

1.8.7 Hart Signal Multiplexer Module ELCON Series 1700

The Hart Signal Multiplexer Modules Series 1700 is a gateway device routing communications between a P.C. installed in the safe area and a number of Smart Transmitters located in the field using the Hart Protocol on both the RS-485 link to the P.C. and on the Bell 202 FSK link to each of the Smart Transmitters.

Every module can interface up to 32 Transmitters and has to be mounted on an ELCON Termination Board which provides a connector for the module (see Section 1.8.2 Termination Board).

Please note that up to 31 Multiplexers can be connected on the same RS-485 network.

For more information, please refer to *ELCON Instruments documentation* (see Section 1.5 Related Documentation) and to the ABB manual *HART Protocol Interface User´s Guide*.

1.8.8 Reference Guide

Reference guide for selection of equipment see Table 1-3.

Table 1-3. Reference Guide for Selection of Equipment

S100 I/O Kit (1)		**Intrinsic Safety Isolator Module (2)**			
Board + Cable	**Article No.**	**Interface Adapter Card**	**Termination Board**	**Single Channel**	**Dual Channel**
DSAI 130 DSTK 160L10 cable 10 m (33 ft)	3BSE008317R1	IA-AB-AI-02-I	1216/TB-CON1-DS 1216/CW-CON3-DS	1011, 1021, 1025, 1023, 1061, 1071, 1090	1012, 1022, 1026, 1062, 1072
DSAI 130 DSTK 160L15 cable 15 m (49 ft)	3BSE008319R1	IA-AB-AI-02-I	1216/TB-CON1-DS 1216/CW-CON3-DS	1011, 1021, 1025, 1023, 1061, 1071, 1090	1012, 1022, 1026, 1062, 1072
DSAI 133 DSTK 152SL10 cable 10 m (33 ft)	3BSE008318R1	IA-AB-AIO-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS 1216/TB-CON5-H-DS	1011, 1021, 1025, 1023, 1061, 1071, 1090	1012, 1022, 1026, 1062, 1072
DSAI 133 DSTK 152SL15 cable 15 m (49 ft)	3BSE008320R1	IA-AB-AIO-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS 1216/TB-CON5-H-DS	1011, 1021, 1025, 1023, 1061, 1071, 1090	1012, 1022, 1026, 1062, 1072
DSAO 120 DSTK 153SL10 cable 10 m (33 ft)	3BSE008321R1	IA-AB-AO-02-I	1208/TB-BA-1 1216/TB-CON1-DS (3) 1216/CW-CON3-DS (3) 1216/TB-CON5-H-DS (3)	1031, 1033 (4),1037	1032, 1034 (4), 1038
DSAO 120 DSTK 153SL15 cable 15 m (49 ft)	3BSE008322R1	IA-AB-AO-02-I	1208/TB-BA-1 1216/TB-CON1-DS (3) 1216/CW-CON3-DS (3) 1216/TB-CON5-H-DS (3)	1031, 1033 (4),1037	1032, 1034 (4), 1038

Table 1-3. Reference Guide for Selection of Equipment (Continued)

S100 I/O Kit [(1)]		**Intrinsic Safety Isolator Module** [(2)]			
Board + Cable	**Article No.**	**Interface Adapter Card**	**Termination Board**	**Single Channel**	**Dual Channel**
DSDI 110A DSTK 165SL10 cable 10 m (33 ft)	3BSE008329R1	IA-AB-DI-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS	1821, 1841, 1893	
DSDI 110A DSTK 160L10 cable 10 m (33 ft)	3BSE008365R1	IA-AB-DI-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS		1822, 1842
DSDI 110A DSTK 165SL15 cable 15 m (49 ft)	3BSE008330R1	IA-AB-DI-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS	1821, 1841, 1893	
DSDI 110A DSTK 160L15 cable 15 m (49 ft)	3BSE008366R1	IA-AB-DI-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS		1822, 1842
DSDO 110 DSTK 165SL10 cable 10 m (33 ft)	3BSE008331R1	IA-AB-DO-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS	1861, 1871, 1881	
DSDO 110 DSTK 160L10 cable 10 m (33 ft)	3BSE008367R1	IA-AB-DO-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS		1862, 1872, 1882
DSDO 110 DSTK 165SL15 cable 15 m (49 ft)	3BSE008332R1	IA-AB-DO-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS	1861, 1871, 1881	
DSDO 110 DSTK 160L15 cable 15 m (49 ft)	3BSE008368R1	IA-AB-DO-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS		1862, 1872, 1882
DSDP 110 DSTK 165SL10 cable 10 m (33 ft)	3BSE008325R1	IA-AB-DI-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS	1841, 1893	
DSDP 110 DSTK 160L10 cable 10 m (33 ft)	3BSE008363R1	IA-AB-DI-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS		1842
DSDP 110 DSTK 165SL15 cable 15 m (49 ft)	3BSE008327R1	IA-AB-DI-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS	1841, 1893	
DSDP 110 DSTK 160L15 cable 15 m (49 ft)	3BSE008364R1	IA-AB-DI-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS		1842
DSDP 150 DSTK160L10 cable 10 m (33 ft)	3BSE008326R1	IA-AB-DP-01-I	1208/TB-BA-1 1216/TB-CON1-DS 1216/CW-CON3-DS	1841, 1893	1842

Table 1-3. Reference Guide for Selection of Equipment (Continued)

S100 I/O Kit (1)		**Intrinsic Safety Isolator Module (2)**			
Board + Cable	**Article No.**	**Interface Adapter Card**	**Termination Board**	**Single Channel**	**Dual Channel**
DSDP 150 DSTK 160L15 cable 15 m (49 ft)	3BSE008328R1	IA-AB-DP-01-I	1208/TB-BA-1 1216/TB-CON1-DS 1216/CW-CON3-DS	1841, 1893	1842
DSAX 110 DSTK 153SL10 cable 10 m (33 ft)	3BSE008323R1	IA-AB-AIO-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS 1216/TB-CON5-H-DS	1011, 1021, 1023, 1025, 1061, 1071, 1031, 1033 (4), 1037, 1090	1012, 1022, 1026, 1032, 1034 (4), 1038, 1062, 1072
DSAX 110 DSTK 153SL15 cable 15 m (49 ft)	3BSE008324R1	IA-AB-AIO-01-I	1216/TB-CON1-DS 1216/CW-CON3-DS 1216/TB-CON5-H-DS	1011, 1021, 1023, 1025, 1061, 1071, 1031, 1033 (4), 1037, 1090	1012, 1022, 1026, 1032, 1034 (4), 1038, 1062, 1072

(1) Ordering information see Product Guide and valid Price Lists for Advant Controller 400 Series and S100 I/O.
(2) Ordering information, see ELCON Instruments Catalog and valid Price List.
(3) Two Interface Adapter Cards per Termination Board
(4) 1033 and 1034 only for load 125Ω.

1.8.9 Cabinets

The Advant Controller 400 Series is installed in standard cabinets, see *User's Guides for the different products in Advant Controller 400 Series*. The I/O boards for Intrinsic Safety System will in Advant Controller 450, be placed in subrack which are located in the right part of the cabinet configuration.

The Intrinsic Safety system can be installed in a ELCON Instruments cabinet or in an ABB RE5xx cabinet. Installation in ELCON Instruments cabinet see *ELCON Instruments' catalog*.

Installation in RE5xx cabinet see Figure 1-3.
Cabinet can be both single and double sided.

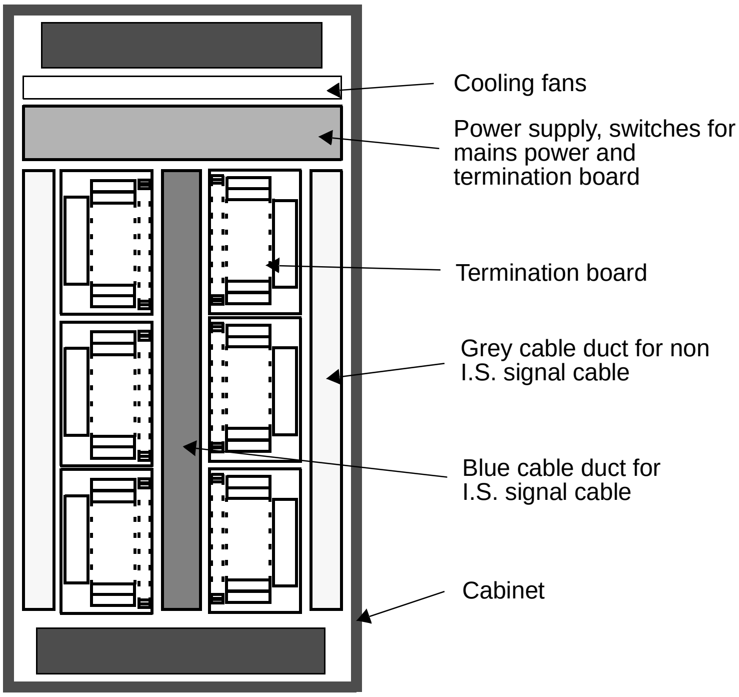
Cooling fans
Power supply, switches for mains power and termination board
Termination board
Grey cable duct for non I.S. signal cable
Blue cable duct for I.S. signal cable
Cabinet

Figure 1-3. Intrinsic Safety System in RE5xx Cabinet

1.8.10 Ordering and Deliveries

Advant Controller 400 Series shall be ordered from ABB according to the *Advant OCS Product Guide*.

Intrinsic Safety system shall be ordered from ELCON Instruments Factory in Italy according to ELCON Instruments conditions of purchase.

ABB delivers the Advant Controller 400 Series in ABB standard cabinets.

ELCON Instruments delivers the Intrinsic Safety system in ELCON Instruments standard cabinet or in ABB RE5xx cabinet.

1.9 User Interface

Not applicable.

Chapter 2 Installation

2.1 Site Planning Environment

The cables between the Advant Controller 400 Series and the Intrinsic Safety System can have a length of maximum 15 m (49 ft), which limits the distance between the cabinets to about 9 m (30 ft).

For further information, please refer to the documentation according to the document list in Section 1.5 Related Documentation.

2.1.1 Grounding

The cabinets must be grounded to the same grounding system.

For further information, please refer to the documentation according to the document list in Section 1.5 Related Documentation.

2.1.2 Power Supply

The 24 V power supply to the I.S. isolator modules and the S100 I/O boards must be connected to the same reference ground.

2.2 Setup

2.2.1 Advant Controller 400

For installation of Advant Controller 400 Series, see *Advant Controller 410 User´s Guide or Advant Controller 450 User´s Guide*.

2.2.2 Intrinsic Safety System

For installation of Intrinsic Safety System, see *ELCON Instruments Instruction Manual for Series 1000 Equipment*.

The connections between Advant Controller 400 Series and Intrinsic Safety System Series 1000 are done with screened standard cables. The cables are in the Advant Controller 400 Series end connected directly to the S100 I/O board and in the Intrinsic Safety System end to the corresponding Interface Adapter Card. The cable screen must be connected to ground in both ends.

The cables are normally guided into the cabinet from below but can also be from the top.

At delivery the cables between Advant Controller 400 Series and Intrinsic Safety System Series 1000 are connected to the I/O boards in the Controller end. The other end of the cables are free and marked with the item designation for the I/O board that they are connected to.

2.2.2.1 DSAI 130

The I.A.C. has different connectors for single and dual Intrinsic Safety Isolator modules, see Figure 2-1.

With use of single channel modules:

X1: Not used
X2: Not used
X3: Channel 1-16

With use of dual channel modules:

X1: Channel 1-16 (first DSAI 130)
X2: Channel 17-32 (second DSAI 130)
X3: Not used

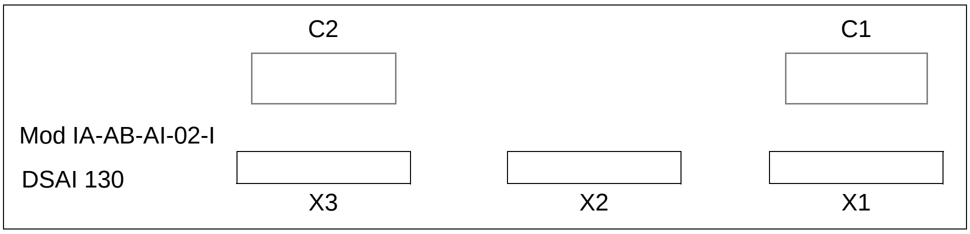

Figure 2-1. Interface Adapter Card for DSAI 130

2.2.2.2 DSAI 133

The I.A.C. has different connectors and a configuration switch SW1 for single and dual Intrinsic Safety Isolator modules, see Figure 2-2.

With use of single channel modules:

X1: Not used
X2: Not used
X3: (first termination board): Channel 1-16, cable connector 1
X3: (second termination board): Channel 17-32, cable connector 2

With use of single channel modules and redundancy, see Figure 2-3:

X1: Not used
X2: Not used
X3: (first termination board): Channel 1-16 on first DSAI 133, cable connector 1
X3: (second termination board): Channel 17-32 on first DSAI 133, cable connector 2
X4: (first termination board): Channel 1-16 on second DSAI 133, cable connector 1
X4: (second termination board): Channel 17-32 on second DSAI 133, cable connector 2

With use of dual channel modules, not redundant configuration:

X1: Channel 1-16, cable connector 1
X2: Channel 17-32, cable connector 2
X3: Not used
X4: Not used

SW1: All switches in position on

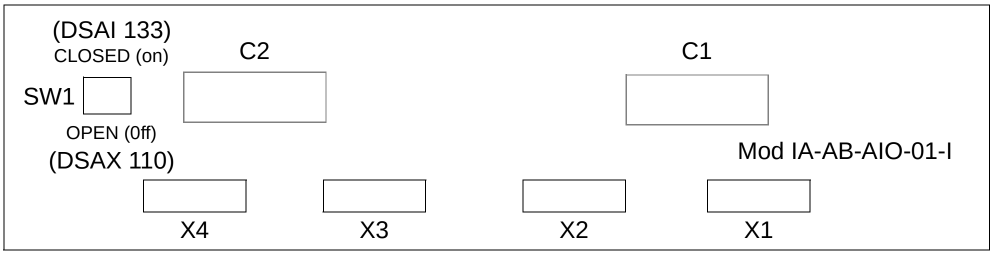

Figure 2-2. Interface Adapter Card for DSAI 133

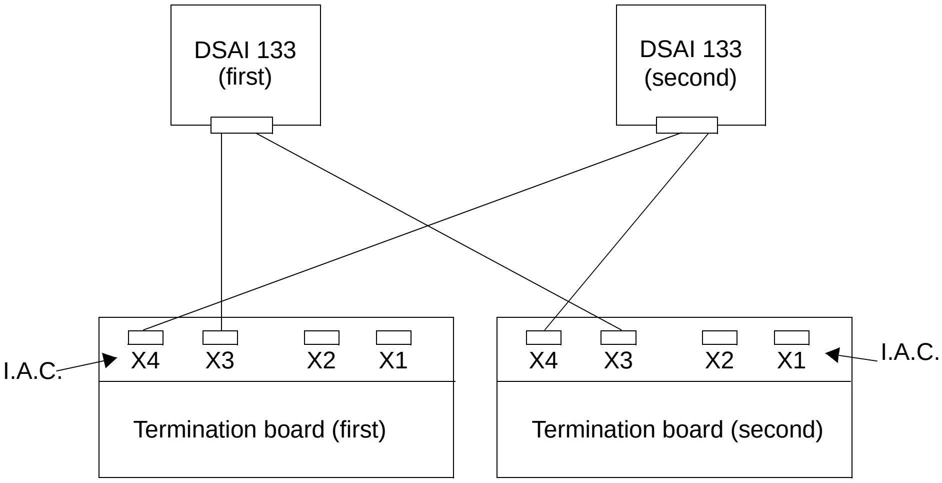

Figure 2-3. DSAI 133 in Redundant Configuration

2.2.2.3 DSAO 120

The Interface Adapter Card has different connectors for single and dual Intrinsic Safety Isolator modules, see Figure 2-4.

With use of single channel modules:

X1: Not used
X2: Not used
X3: Channel 1-8

With use of dual channel modules:

X1: Channel 1-8 (first DSAO 120)
X2: Channel 9-16 (second DSAO 120)
X3: Not used

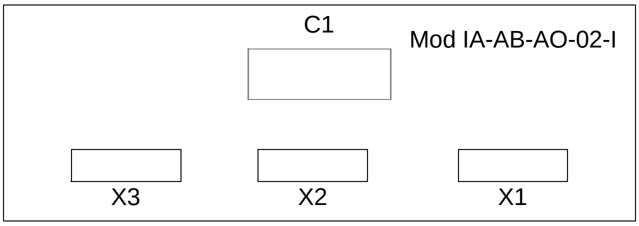

Figure 2-4. Interface Adapter Card for DSAO 120

2.2.2.4 DSAX 110

DSAX 110 use the same Interface Adapter Card as DSAI 133, see Section 2.2.2.2 DSAI 133.

With use of single channel modules:

X1: Not used
X2: Not used
X3: Channel 1-16 (channel 1-8 for analog inputs, channel 9-16 for analog outputs)
X4: Not used

With use of single channel modules and redundancy, see Figure 2-5:

X1: Not used
X2: Not used
X3: Channel 1-16 on first DSAX 110 (channel 1-8 for analog inputs, channel 9-16 for outputs)
X4: Channel 1-16 on second DSAX 110 (channel 1-8 for analog inputs, channel 9-16 for analog outputs)

With use of dual channel modules, not redundant configuration:

X1: Channel 1-16 (first DSAX 110) (channel 1-8 for analog inputs, channel 9-16 for analog outputs)
X2: Channel 17-32 (second DSAX 110) (channel 17-24 for analog inputs, channel 25-32 for analog outputs)
X3: Not used
X4: Not used

SW1: All switches in position off

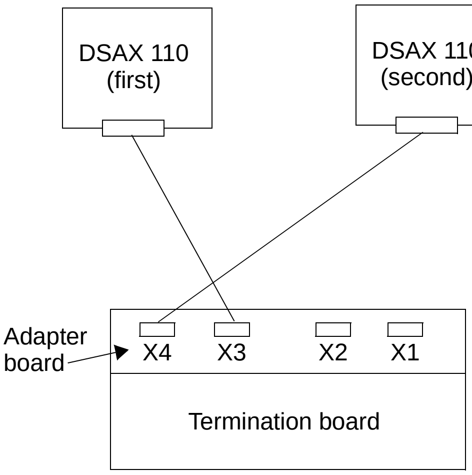

Figure 2-5. DSAX 110 in Redundant Configuration

2.2.2.5 DSDI 110A/115, DSDO 110/115 and DSDP 110

The Interface Adapter Card has different connectors for single and dual Intrinsic Safety Isolator modules, see Figure 2-6 and Figure 2-7.

With use of single channel modules:

X1: Not used
X2: (first termination board): Channel 1-8, cable connector 1
X3: (first termination board): Channel 9-16, cable connector 2
X2: (second termination board): Channel 17-24, cable connector 1
X3: (second termination board): Channel 25-32, cable connector 2

With use of dual channel modules:

X1: Channel 1-32
X2: Not used
X3: Not used

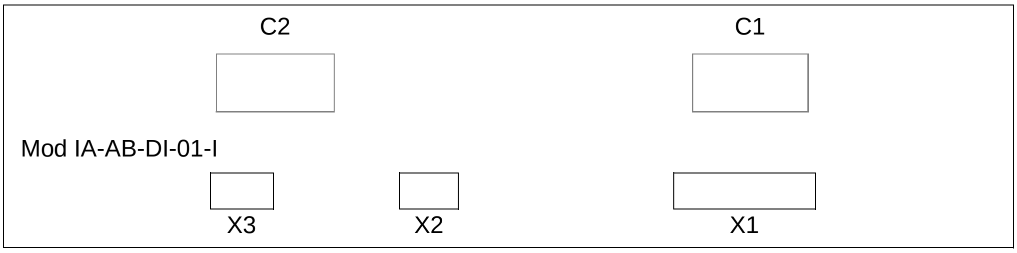

Figure 2-6. Interface Adapter Card for DSDI 110/115 and DSDP 110

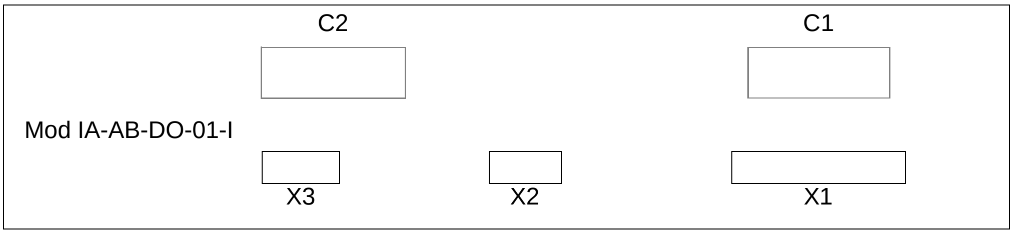

Figure 2-7. Interface Adapter Card for DSDO 110/115

2.2.2.6 DSDP 150

The Interface Adapter Card has different connectors for single and dual Intrinsic Safety Isolator modules, see Figure 2-8. With single modules up to 10 kHz and with dual modules up to 2 kHz.

With use of single channel modules:

X1: Not used
X2: Channel 1-8

With use of dual channel modules:

X1: Channel 1-12
X2: Not used

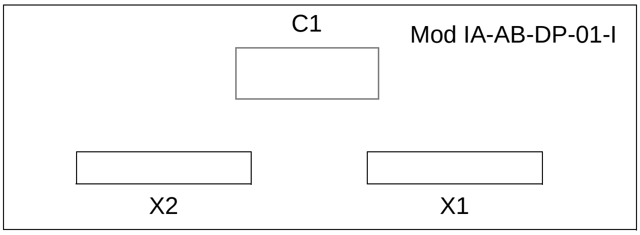

Figure 2-8. Interface Adapter Card for DSDP 150

Chapter 3 Configuration/Application Building

3.1 Design Considerations

3.1.1 Termination Board

The termination board must have one reference sensor for cold junction compensation per channel if I.S. Isolator modules for thermocouple are used.

3.1.2 Intrinsic Safety Isolator Module

The function and signal range can be changed with jumpers on most of the I.S. Isolator modules, see *ELCON Instruments documentation* for the I.S. Isolator modules. All analog input I.S. Isolator modules must be configurated for 1-5 V output. Burnout can on module 1061 and 1062 be configuration for forces of output upscale, downscale or none.

On module 1071 and 1072 is the burnout function always active and force output upscale.

3.1.3 AI and AX Boards

All AI channels that are connected towards the Intrinsic Safety System must be configured for 1-5 V.

3.1.4 AO and AX Boards

All AO channels that are connected towards the Intrinsic Safety System must be configured for current output 4-20 mA.

The output I.S. Isolator module 1033 and 1034 can not be used if the load ≥125 Ω

3.1.5 DI, DO and DP Board

No specific configuration is necessary except for DSDP 150.

For DSDP 150 must the input channels connected to I.S. Isolator modules been jumped for input signal level 24 V, see *S100 I/O Hardware Reference Manual, Chapter 4*.

The I.S Isolator modules for DO can be used as Bus powered or Loop powered.

3.2 Capacity & Performance

3.2.1 Technical Data

This document only deals with technical data influenced by the fact that the Advant Controller 400 Series works together with ELCON Instruments Intrinsic Safety System Series 1000.

Technical data for Advant Controller 400 Series and the Intrinsic Safety System Series 1000 see documentation for each system according to the document list in Section 1.5 Related Documentation.

3.2.2 Analog Input

The maximum inaccuracy and the delay time for a analog input can be calculated as the sum of the inaccuracy and delay time of the system parts, Advant Controller 400 Series and Intrinsic Safety System Series 1000.

3.2.3 Analog Output

The maximum inaccuracy and the delay time for a analog output can be calculated as the sum of the inaccuracy and delay time of the system parts, Advant Controller 400 Series and Intrinsic Safety System Series 1000.

3.2.4 Digital Input

The maximum delay time for a digital input can be calculated as the sum of the delay time of the system parts, Advant Controller 400 Series and Intrinsic Safety System Series 1000.

With use of time stamp of digital input signals the time delay in the I.S. Isolator module will be add to the time.

3.2.5 Digital Output

The maximum delay time for a digital output can be calculated as the sum of the delay time of the system parts, Advant Controller and Intrinsic Safety System.

3.3 Application Procedures

No specific application programming must be done, except for the thermocouple and RTD signals. For the thermocouple signals the linearization and scaling of value in Fahrenheit or Celsius must be done in the application program. For RTD signals only scaling of value in Fahrenheit or Celsius is required in the application program.

3.3.1 Linearization and Scaling

Application program for linearization and scaling see Figure 3-1.

The value to be entered on RANGEMIN and RANGEMAX terminal of the data base element for analog input channel see Table 3-2 for signal range in °C and Table 3-3 for signal range in °F.
For example with a signal range of 300 to 800 °C and a thermocouple of type J:

- For RANGEMIN value look in Table 3-2, column “TC type J” for the corresponding value to 300 °C (16325).
- For RANGEMAX value look in same table and column but for the corresponding value to 800 °C (45498).

The values are the same as the output value out from the thermocouple at the minimum and maximum values of the present signal range with the reference temperature at 0 °C.

The values to be entered on inputs I1 to I30 on PC element REG-G item designations .1 and .2 is found in Table 3-4 and Table 3-5. The values for REG-G .1 are the temperature values in °C for the given temperature points. The values for REG-G .2 are the values in µV as output from the thermocouple at given temperature points with a reference temperature of 0 °C.

The PC-elements .4 and .5 are used for conversion of the signal from °C to °F and can leave out if the output value shall be in °C.

Conversion to°F can also be done directly if the values to REG-G .1 are given in °F instead of in °C.

With a linearization according to values in the Table 3-4 and Table 3-5 will give the following deviation on account of the linearization, see Table 3-1.

Table 3-1. Deviation on Account of Linearization

TC Type	**Max Deviation in**	
	°C	**°F**
B	0.50	0.90
E	0.40	0.72
J	0.21	0.36
K	0.40	0.72
R	0.35	0.63
S	0.30	0.54
T	0.35	0.63

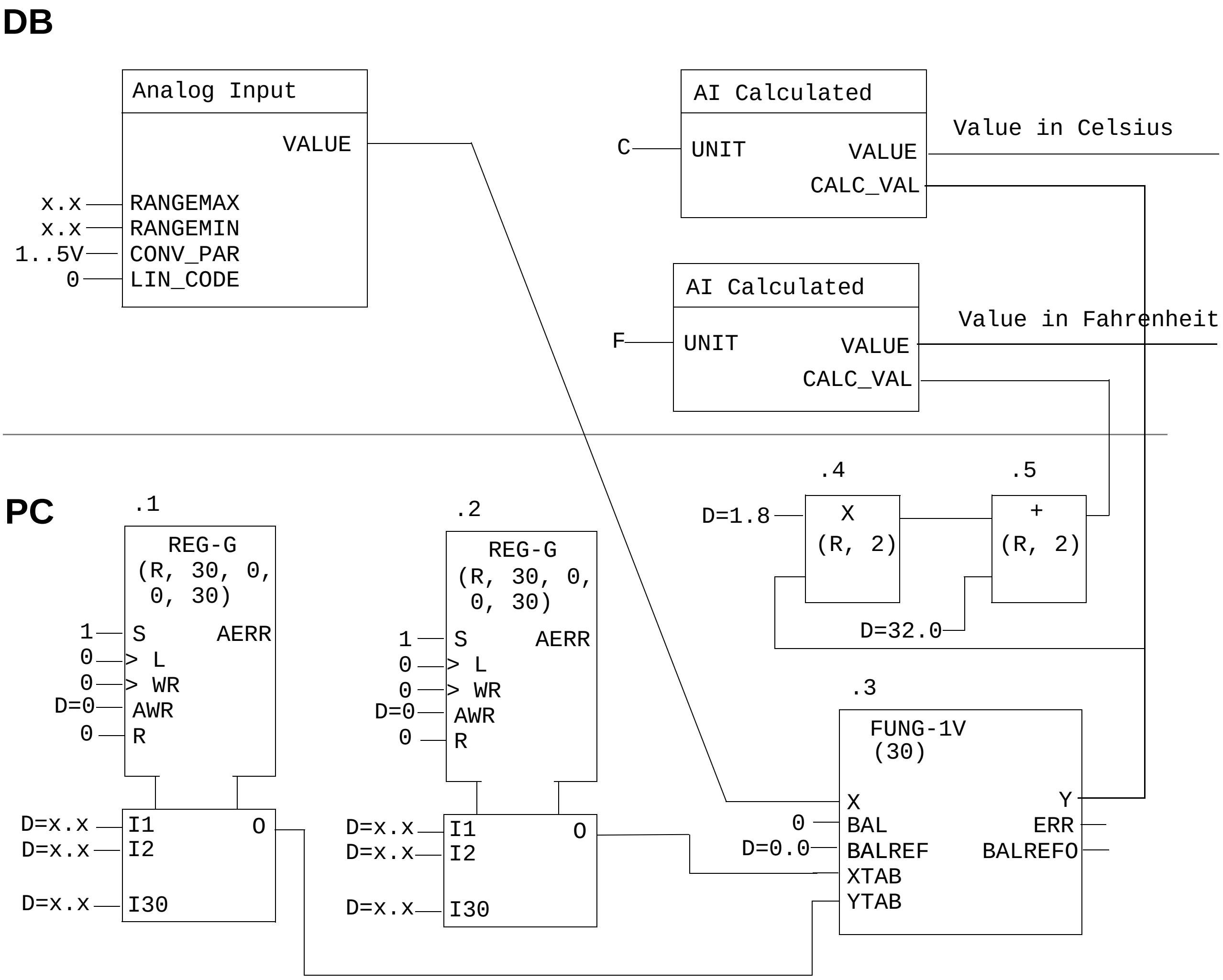

Figure 3-1. Application Program for Linearization and Scaling of TC Signal

Table 3-2. Signal Range Max and Min Value for TC Type B, E, J, K, R, S and T in °C

Temperature in °C	**RANGEMIN and RANGEMAX value TC Type**						
	TC Type B	**TC Type E**	**TC Type J**	**TC Type K**	**TC Type R**	**TC Type S**	**TC Type T**
-200	-	-8824	-7890	-5891	-	-	-5603
-150	-	-7279	-6499	-4912	-	-	-4648
0	0	0	0	0	0	0	0
120	53	7683	6359	4919	800	795	5227
150	92	9787	8008	6137	1041	1029	6702
180	140	11949	9667	7338	1294	1273	8235
200	178	13419	10777	8137	1468	1440	9286
220	220	14909	11887	8938	1647	1611	10360
250	291	17178	13553	10151	1923	1873	12011
300	431	21033	16325	12207	2400	2323	14860
350	596	24961	19089	14292	2896	2786	17816
400	786	28943	21846	16395	3407	3260	20869
500	1241	36999	27388	20640	4471	4234	-
550	1505	41045	30210	22772	5021	4732	-
600	1791	45085	33096	24902	5582	5237	-
700	2430	53110	39130	29128	6741	6274	-
800	3154	61022	45498	33277	7949	7345	-
850	3546	64924	48716	35314	8570	7892	-
900	3957	68783	51875	37325	9203	8448	-
1000	4833	76358	57942	41269	10503	9585	-
1100	5777	-	63777	45108	11846	10754	-
1200	6783	-	69536	48828	13224	11947	-
1300	7845	-	-	52398	14624	13155	-
1400	8952	-	-	-	16035	14368	-
1500	10094	-	-	-	17445	15576	-
1600	11257	-	-	-	18842	16771	-
1750	13008	-	-	-	20878	18504	-
1800	13585	-	-	-	-	-	-

Table 3-3. Signal Range Max and Min Value for TC Type B, E, J, K, R, S and T in °F

Temperature in °F	**RANGEMIN and RANGEMAX value TC type**						
	TC Type B	**TC Type E**	**TC Type J**	**TC Type K**	**TC Type R**	**TC Type S**	**TC type T**
-300	-	-8404	-7519	-5632	-	-	-5341
0	6	-1026	-885	-692	-89	-92	-674
250	55	7760	6420	4964	809	803	5281
300	90	9708	7947	6092	1032	1020	6647
350	135	11706	9483	7205	1265	1245	8062
400	187	13748	11023	8314	1508	1478	9523
450	248	15829	12566	9430	1758	1717	11027
500	317	17942	14108	10560	2017	1962	12572
600	479	22248	17186	12854	2552	2465	15769
700	673	26637	20253	15178	3110	2985	19095
800	898	31082	23317	17523	3686	3516	22519
900	1153	35562	26396	19883	4278	4058	-
1000	1438	40056	29515	22251	4885	4609	-
1100	1752	44547	32707	24618	5507	5169	-
1200	2093	49020	35999	26975	6143	5740	-
1300	2461	53465	39407	29315	6794	6321	-
1400	2855	57873	42922	31629	7460	6913	-
1500	3274	62240	46503	33913	8141	7514	-
1600	3717	66559	50059	36166	8836	8126	-
1700	4183	70821	53525	38387	9546	8748	-
1800	4672	75024	56886	40575	10269	9380	-
1900	5182	-	60163	42732	11006	10023	-
2000	5712	-	63392	44856	11756	10675	-
2200	6829	-	69790	48990	13286	12001	-
2400	8014	-	-	52939	14843	13344	-
2700	9889	-	-	-	17195	15362	-
2900	11179	-	-	-	18750	16692	-
3200	13124	-	-	-	21006	18612	-
3300	13763	-	-	-	-	-	-

Table 3-4. Input Value for PC- elements REG-G for TC Type B, E, J, R in µV and °C

REG-G input I1 to I30.	TC Type B		TC Type E		TC Type J		TC Type K	
	REG-G .2 (µV)	REG-G .1 (°C)	REG-G .2 (µV)	REG-G .1 (°C)	REG-G .2 (µV)	REG-G .1 (°C)	REG-G .2 (µV)	REG-G .1 (°C)
1	0	0	-9172	-215	-8096	-210	-6458	-270
2	159	190	-8824	-200	-7890	-200	-6455	-267
3	194	208	-8333	-182	-7634	-189	-6444	-261
4	254	235	-7665	-161	-7293	-176	-6425	-255
5	325	263	-6792	-137	-6883	-162	-6394	-248
6	395	288	-5680	-110	-6365	-146	-6337	-239
7	477	315	-4350	-81	-5764	-129	-6243	-228
8	592	349	-2681	-48	-4996	-109	-6111	-216
9	715	382	-639	-11	-4087	-87	-5922	-202
10	848	415	2047	34	-2984	-62	-5642	-185
11	1020	454	5049	81	-1626	-33	-5271	-166
12	1226	497	8587	133	50	1	-4792	-145
13	1450	540	11876	179	2163	42	-4166	-121
14	1703	585	16417	240	4942	94	-3368	-94
15	1986	632	17101	249	9113	170	-2347	-63
16	2322	684	17942	260	20192	370	-1043	-27
17	2742	724	25278	354	26997	493	758	19
18	3154	800	32074	439	30724	559	6258	153
19	3634	861	49029	649	33918	614	10723	264
20	4186	927	49911	660	36975	665	15636	382
21	4796	996	60159	789	40193	717	28961	696
22	5458	1067	61022	800	44271	781	33850	814
23	6212	1144	64069	839	49799	867	38281	924
24	7054	1226	64924	850	53238	922	42548	1033
25	8019	1316	65622	859	56634	978	46500	1137
26	9155	1418	66473	870	60585	1045	49772	1226
27	10709	1553	73274	959	68103	1175	52677	1308
28	13470	1790	74104	970	69536	1200	54875	1372
29	13814	1820	76283	999	70334	1214	54875	1372
30	13975	1834	77333	1013	70334	1214	54875	1372

Table 3-5. Input Value for PC- elements REG-G for TC Type K, S, T in µV and °C

REG-G input I1 to I30.	**TC Type R**		**TC Type S**		**TC Type T**	
	REG-G .2 (µV)	**REG-G .1 (°C)**	**REG-G .2 (µV)**	**REG-G .1 (°C)**	**REG-G .2 (µV)**	**REG-G .1 (°C)**
1	-226	-50	-236	-50	-6258	-270
2	-180	-38	-164	-33	-6251	-266
3	-100	-20	-83	-16	-6232	-260
4	5	1	16	3	-6204	-254
5	123	22	154	27	-6160	-247
6	264	45	318	53	-6087	-238
7	445	72	502	80	-5985	-228
8	662	102	719	110	-5823	-215
9	927	136	997	146	-5587	-199
10	1225	172	1297	183	-5297	-182
11	1602	215	1680	228	-4928	-163
12	2054	264	2141	280	-4466	-142
13	2616	322	2692	340	-3897	-119
14	3252	385	3346	409	-3206	-94
15	4007	457	4076	484	-2380	-67
16	4832	533	4903	567	-1370	-37
17	5707	611	5668	642	-193	-5
18	6576	686	6592	730	1279	32
19	7496	763	7454	810	2819	68
20	8495	844	8336	890	4701	109
21	9563	928	9320	977	6903	154
22	10675	1013	10341	1065	9446	203
23	11969	1109	11599	1171	12347	256
24	13572	1225	13482	1327	15736	315
25	16726	1449	15781	1517	19577	379
26	18815	1598	17067	1625	20869	400
27	20229	1701	17999	1705	22782	431
28	20955	1756	18526	1752	22782	431
29	21121	1769	18709	1769	22782	431
30	21394	1790	18841	1781	22782	431

Chapter 4 Runtime Operation

Not applicable

Chapter 5 Maintenance

5.1 Hardware Indicators

S100 I/O boards, termination boards and most of the I.S. Isolator modules have LED indicators showing different type of status, see documentation for each board and module.

5.2 Fault Finding and User Repair

The fault finding description in this document is intended to be a help to find out in which of the parts, process, Intrinsic Safety System or Advant Controller 400 Series a fault is located.

5.2.1 Analog Input Signals

Check the LED indicators on the termination board, the I.S. Isolator module and the analog input board according to the table.

Table 5-1. Control of LED Indicators

I.S. Isolator Module	**Analog Input Board**		**Action**
Power on	**F**	**C**	
off	X	X	The fault is located in the Intrinsic Safety System
on	on	X	The fault is located in the Advant Controller 400 Series
on	off	off	The fault is located in the Advant Controller 400 Series
on	off	on (1)	Check the signal level on the input and the output of the I.S. Isolator module

(1) Can also flash.

Check the Signal Level on the Input and the Output of the I.S. Isolator Module.

The best point to measure the output signal from the I.S. Isolator module is to use the not used connectors on the adapter board. To find the right pins, see Table 5-3 to 5-5. Connect the voltmeter between the channel and U-, the voltmeter should have high input impedance. Output from the I.S. Isolator module is 1 to 5 V for 0 to 100% signal.

Measuring of input signal for I.S. Isolator modules 1011/12:

- Type of input signal is dependent of the configuration (voltage or current)

Measuring of input signal for I.S. Isolator modules 1021/22, 1023 and 1025/26:

- Measure the input current (4-20 mA)
- If the input signal is under 4 mA measure the voltage over the input (13-18 V)
- If the in put signal is under 5 V brake up the process connection
  - If it is still low the fault is located in the Intrinsic Safety System (I.S. Isolator module)
  - If it goes high the fault is located in the process

Measuring of input signal for I.S. Isolator modules 1061/62:

- Input voltage is dependent of thermocouple type and the sensor temperature (from -9 mV up to 80 mV), see *Isolators Series 1000 Manuals*.

Measuring of input signal for I.S. Isolator modules 1071/72:

- Measure the input voltage (input voltage = 0.25 mA * sensor resistance)

Measuring of input signal for I.S. Isolator modules 1090:

- How to measure the input signal is dependent of the configuration, see *Isolators Series 1000 Manuals*.

Table 5-2. Conclusions of Measuring

Signal	Action
Input ok, output wrong	The fault is located in the Intrinsic Safety System
Input ok, output ok	The fault is located in the Advant Controller 400 Series
Input wrong	The fault is located in the process or in the Intrinsic Safety System

Table 5-3. Interface Adapter Card Connector pinning for DSAI 130

Ex i Module		X1		X2		X3	
Pos	**Mod Ch**	**Pin**	**Sign**	**Pin**	**Sign**	**Pin**	**Sign**
1	1	A19	ICh1+			A19	ICh1+
		B19	ICh1-			B19	ICh1-
	2	A18	ICh2+				
		B18	ICh2-				
2	1	A17	ICh3+			A18	ICh2+
		B17	ICh3-			B18	ICh2-
	2	A16	ICh4+				

Table 5-3. Interface Adapter Card Connector pinning for DSAI 130 (Continued)

Ex i Module		**X1**		**X2**		**X3**	
Pos	**Mod Ch**	**Pin**	**Sign**	**Pin**	**Sign**	**Pin**	**Sign**
		B16	ICh4-				
3	1	A15	ICh5+			A17	ICh3+
		B15	ICh5-			B17	ICh3-
	2	A13	ICh6+				
		B13	ICh6-				
4	1	A12	ICh7+			A16	ICh4+
		B12	ICh7-			B16	ICh4-
	2	A11	ICh8+				
		B11	ICh8-				
5	1	A10	ICh9+			A15	ICh5+
		B10	ICh9-			B15	ICh5-
	2	A9	ICh10+				
		B9	ICh10-				
6	1	A8	ICh11+			A13	ICh6+
		B8	ICh11-			B13	ICh6-
	2	A6	ICh12+				
		B6	ICh12-				
7	1	A5	ICh13+			A12	ICh7+
		B5	ICh13-			B12	ICh7-
	2	A4	ICh14+				
		B4	ICh14-				
8	1	A3	ICh15+			A11	ICh8+
		B3	ICh15-			B11	ICh8-
	2	A2	ICh16+				
		B2	ICh16-				
9	1			A19	ICh1+	A10	ICh9+
				B19	ICh1-	B10	ICh9-
	2			A18	ICh2+		
				B18	ICh2-		
10	1			A17	ICh3+	A9	ICh10+
				B17	ICh3-	B9	ICh10-

Table 5-3. Interface Adapter Card Connector pinning for DSAI 130 (Continued)

Ex i Module		**X1**		**X2**		**X3**	
Pos	**Mod Ch**	**Pin**	**Sign**	**Pin**	**Sign**	**Pin**	**Sign**
	2			A16	ICh4+		
				B16	ICh4-		
11	1			A15	ICh5+	A8	ICh11+
				B15	ICh5-	B8	ICh11-
	2			A13	ICh6+		
				B13	ICh6-		
12	1			A12	ICh7+	A6	ICh12+
				B12	ICh7-	B6	ICh12-
	2			A11	ICh8+		
				B11	ICh8-		
13	1			A10	ICh9+	A5	ICh13+
				B10	ICh9-	B5	ICh13-
	2			A9	ICh10+		
				B9	ICh10-		
14	1			A8	ICh11+	A4	ICh14+
				B8	ICh11-	B4	ICh14-
	2			A6	ICh12+		
				B6	ICh12-		
15	1			A5	ICh13+	A3	ICh15+
				B5	ICh13-	B3	ICh15-
	2			A4	ICh14+		
				B4	ICh14-		
16	1			A3	ICh15+	A2	ICh16+
				B3	ICh15-	B2	ICh16-
	2			A2	ICh16+		
				B2	ICh16-		
		B1	0V	B1	0V	B1	0V
		B20	0V	B20	0V	B20	0V
		B7	0V	B7	0V	B7	0V
		B14	0V	B14	0V	B14	0V

Table 5-4. Interface Adapter Card Connector pinning for DSAI 133

Ex i Mod		Con. X1		Ex i Mod		Con. X2		Ex i Mod		Con X3 & X4	
Pos	**Ch**	**Pin**	**Sign.**	**Pos**	**Mod Ch**	**Pin**	**Sign.**	**Pos**	**Ch**	**Pin**	**Sign.**
		B13	U+			B13	U+			B13	U+
1	1	A13	CH1	9	1	A13	CH17	1	1	A13	CH1
	2	B12	CH2		2	B12	CH18	2	1	B12	CH2
2	1	A12	CH3	10	1	A12	CH19	3	1	A12	CH3
	2	B11	CH4		2	B11	CH20	4	1	B11	CH4
3	1	A11	CH5	11	1	A11	CH21	5	1	A11	CH5
	2	B10	CH6		2	B10	CH22	6	1	B10	CH6
4	1	A10	CH7	12	1	A10	CH23	7	1	A10	CH7
	2	B9	CH8		2	B9	CH24	8	1	B9	CH8
		A9	U-			A9	U-			A9	U-
		B8	U-			B8	U-			B8	U-
		A8	U+			A8	U+			A8	U+
5	1	B7	CH9	13	1	B7	CH25	9	1	B7	CH9
	2	A7	CH10		2	A7	CH26	10	1	A7	CH10
6	1	B6	CH11	14	1	B6	CH27	11	1	B6	CH11
	2	A6	CH12		2	A6	CH28	12	1	A6	CH12
7	1	B5	CH13	15	1	B5	CH29	13	1	B5	CH13
	2	A5	CH14		2	A5	CH30	14	1	A5	CH14
8	1	B4	CH15	16	1	B4	CH31	15	1	B4	CH15
	2	A4	CH16		2	A4	CH32	16	1	A4	CH16
		B3	U-			B3	U-			B3	U-
		A3	U-			A3	U-			A3	U-
		B2	U-			B2	U-			B2	U-
		A2	U-			A2	U-			A2	U-
		B1	U-			B1	U-			B1	U-
		A1	U-			A1	U-			A1	U-

Table 5-5. Interface Adapter Card Connector pinning for DSAX 110

Ex i Mod		**Con. X1**		**Ex i Mod**		**Con. X2**		**Ex i Mod**		**Con X3 & X4**	
Pos	**Mod Ch**	**Pin**	**Sign.**	**Pos**	**Mod Ch**	**Pin**	**Sign.**	**Pos**	**Mod Ch**	**Pin**	**Sign.**
		B13	U+			B13	U+			B13	U+
1	1	A13	ICH1	9	1	A13	ICH9	1	1	A13	ICH1
	2	B12	ICH2		2	B12	ICH10	2	1	B12	ICH2
2	1	A12	ICH3	10	1	A12	ICH11	3	1	A12	ICH3
	2	B11	ICH4		2	B11	ICH12	4	1	B11	ICH4
3	1	A11	ICH5	11	1	A11	ICH13	5	1	A11	ICH5
	2	B10	ICH6		2	B10	ICH14	6	1	B10	ICH6
4	1	A10	ICH7	12	1	A10	ICH15	7	1	A10	ICH7
	2	B9	ICH8		2	B9	ICH16	8	1	B9	ICH8
		A9	U-			A9	U-			A9	U-
		B8	U-			B8	U-			B8	U-
		A8	U+			A8	U+			A8	U+
5	1	B7	OCH1	13	1	B7	OCH9	9	1	B7	OCH1
	2	A7	OCH2		2	A7	OCH10	10	1	A7	OCH2
6	1	B6	OCH3	14	1	B6	OCH11	11	1	B6	OCH3
	2	A6	OCH4		2	A6	OCH12	12	1	A6	OCH4
7	1	B5	OCH5	15	1	B5	OCH13	13	1	B5	OCH5
	2	A5	OCH6		2	A5	OCH14	14	1	A5	OCH6
8	1	B4	OCH7	16	1	B4	OCH15	15	1	B4	OCH7
	2	A4	OCH8		2	A4	OCH16	16	1	A4	OCH8
		B3	U-			B3	U-			B3	U-
		A3	U-			A3	U-			A3	U-
		B2	NC			B2	NC	X3	B2	X4	B1
		A2	NC			A2	NC	X3	A2	X4	A1
		B1	NC			B1	NC	X3	B1	X4	B2
		A1	NC			A1	NC	X3	A1	X4	A2

NOTE

Shaded area shows interconnections between connectors X3 and X4.

5.2.2 Analog Output Signals

Check the LED indicators on the termination board, the I.S. Isolator module and the analog output board according to Table 5-6.

I.S. Isolator module type 1033 and 1034 need no power supply and have therefore no power on indication.

Table 5-6. Control of LED Indicators

I.S. Isolator Module	**Analog Output Board**	**Action**
Power on	**F**	
off	X	The fault is located in the Intrinsic Safety System
on	on	The fault is located in the Advant Controller 400 Series
on	off	Check the signal level on the input and the output of the I.S. Isolator module

Check the Signal Level on the Input and the Output of the I.S. Isolator Module

The best point to measure the input signal to the I.S. Isolator module is to use the not used connectors on the Interface Adapter Card. To find the right pins, see Table 5-5 and Table 5-3. Connect the voltmeter between the channel and U-, the voltmeter should have high input impedance.
The measured voltage should be for I.S. Isolator module type.
1031 and 1032: 0.2 to 1 V for 4 to 20 mA
1033 and 1034: voltage dropout + output current × load residence at 20 mA current
Voltage dropout at 20 mA of 7.5 V (at 500Ω load) up to 9 V (at 0Ω load)

Measuring of output current signal from the I.S. Isolator module:

- Disconnect one of the process cables and connect an ammeter between the cable and the connector (4-20 mA)
- If the load impedance and the line resistance are known is it easier to measure the voltage over the output but the accuracy will not be so high.

  Output voltage = output current × (load impedance + line resistance).

Table 5-7. Interface Adapter Card Connector pinning for DSAO120

Ex i Module		**X1**		**X2**		**X3**	
Pos	**Mod Ch**	**Pin**	**Sign**	**Pin**	**Sign**	**Pin**	**Sign**
1	1	B13	OCh1_C			B13	OCh1_C
	2	B12	OCh2_C				
2	1	B10	OCh3_C			B12	OCh2_C
	2	B9	OCh4_C				
3	1	B7	OCh5_C			B10	OCh3_C
	2	B6	OCh6_C				

Table 5-7. Interface Adapter Card Connector pinning for DSAO120 (Continued)

Ex i Module		**X1**		**X2**		**X3**	
Pos	**Mod Ch**	**Pin**	**Sign**	**Pin**	**Sign**	**Pin**	**Sign**
4	1	B4	OCh7_C			B9	OCh4_C
	2	B3	OCh8_C				
		B11	U-			B11	U-
		B8	U-			B8	U-
5	1			B13	OCh9_C	B7	OCh5_C
	2			B12	OCh10_C		
6	1			B10	OCh11_C	B6	OCh6_C
	2			B9	OCh12_C		
7	1			B7	OCh13_C	B4	OCh7_C
	2			B6	OCh14_C		
8	1			B4	OCh15_C	B3	OCh8_C
	2			B3	OCh16_C		
		B5	U-			B5	U-
		B2	U-			B2	U-
				B11	U-		
				B8	U-		
				B5	U-		
				B2	U-		
		A11	U-	A11	U-	A11	U-
		A12	NC	A12	NC	A12	NC
		A10	NC	A10	NC	A10	NC
		A8	U-	A8	U-	A8	U-
		A9	NC	A9	NC	A9	NC
		A7	NC	A7	NC	A7	NC
		A5	U-	A5	U-	A5	U-
		A6	NC	A6	NC	A6	NC
		A4	NC	A4	NC	A4	NC
		A2	U-	A2	U-	A2	U-
		A3	NC	A3	NC	A3	NC
		A13	NC	A13	NC	A13	NC
		A1	NC	A1	NC	A1	NC
		B1	NC	B1	NC	B1	NC

5.2.3 Digital Input Signals and Pulse Counting Signals

Check the LED indicators on the Termination board, the I.S. Isolator module and the digital input board according to Table 5-8.

Table 5-8. Control of LED Indicators

I.S. Isolator Module			Digital Input Board		Action
Power on	**Fail (1)**	**Ch**	**F**	**Ch**	
off	X	X	X	X	The fault is located in the Intrinsic Safety System
on	X	X	on	X	The fault is located in the Advant Controller 400 Series
on	on	X	X	X	The fault is located in the process (short circuit or open circuit)
on	off	off	off	on	Check the signal level on the output of the I.S. Isolator module (2) if > 15V: the fault is located in the Intrinsic Safety System if < 5V: the fault is located in the Advant Controller 400 Series
on	off	on	off	off	Check the signal level on the output of the I.S. Isolator module (2) if < 5V: the fault is located in the Intrinsic Safety System if > 15V: the fault is located in the Advant Controller 400 Series
on	off	off	off	off	Check the signal level on the input of the I.S. Isolator module (3)
on	off	on	off	on	Check the signal level on the input of the I.S. Isolator module (3)

(1) Only on 1841/42.

(2) The best point to measure the output signal from the I.S. Isolator module is to use the not used connectors on the Interface Adapter Card.
To find the right pins see Table 5-3 and 5-10. Connect a voltmeter between the channel and U-.

(3) The input signals type is dependent of the I.S. Isolator module type and the configuration.
Check of I.S. Isolator module see Instruction Manual for the I.S. Isolator module.

Table 5-9. Interface Adapter Card Connector pinning for DSDI 110A/115 DSDP 110

Ex i Module		**X1**		**X2**		**X3**	
Pos	**Mod Ch**	**Pin**	**Sign**	**Pin**	**Sign**	**Pin**	**Sign**
		B20	U1+	B5	U1+		
1	1	A20	CH1	A5	CH1		
	2	B19	CH2				
2	1	A19	CH3	B4	CH2		
	2	B18	CH4				
3	1	A18	CH5	A4	CH3		
	2	B17	CH6				
4	1	A17	CH7	B3	CH4		
	2	B16	CH8				
		A16	U1-				
		B15	U2+				
5	1	A15	CH9	A3	CH5		
	2	B14	CH10				
6	1	A14	11	B2	CH6		
	2	B13	12				
7	1	A13	13	A2	CH7		
	2	B12	14				
8	1	A12	15	B1	CH8		
	2	B11	16				
		A11	U2-	A1	U1-		
		B10	U3+			B5	U2+
9	1	A10	17			A5	CH9
	2	B9	18				
10	1	A9	19			B4	CH10
	2	B8	20				
11	1	A8	21			A4	CH11

Table 5-9. Interface Adapter Card Connector pinning for DSDI 110A/115 DSDP 110 (Continued)

Ex i Module		**X1**		**X2**		**X3**	
Pos	**Mod Ch**	**Pin**	**Sign**	**Pin**	**Sign**	**Pin**	**Sign**
	2	B7	22				
12	1	A7	23			B3	CH12
	2	B6	24				
	1	A6	U3-				
	2	B5	U4+				
13	1	A5	25			A3	CH13
	2	B4	26				
14	1	A4	27			B2	CH14
	2	B3	28				
15		A3	29			A2	CH15
		B2	30				
16		A2	31			B1	CH16
		B1	32				
		A1	U-			A1	U2-

Table 5-10. Interface Adapter Card Connector pinning for DSDP 150

Ex i Module		**X1**		**X2**	
Pos	**Mod Ch**	**Pin**	**Sign**	**Pin**	**Sign**
		B5	U+	B5	U+
1	1	A10	ICh1	A10	ICh1
	2	B9	ICh2		
2	1	A9	ICh3	B9	ICh2
	2	B8	ICh4		
3	1	A8	ICh5	A9	ICh3
	2	B7	ICh6		
4	1	A5	ICh7	B8	ICh4
	2	B4	ICh8		
		A1	U-	A1	U-
		B10	U+	B10	U+
5	1	A4	ICh9	A8	ICh5
	2	B3	ICh10		
6	1	A3	ICh11	B7	ICh6
	2	B2	ICh12		
7	1			A5	ICh7
	2				
8	1			B4	ICh8
	2				
		A6	U-	A6	U-
9	1			A4	NC
	2				
10	1			B3	NC
	2				
11	1			A3	NC
	2				
12	1			B2	NC

Table 5-10. Interface Adapter Card Connector pinning for DSDP 150 (Continued)

Ex i Module		**X1**		**X2**	
Pos	**Mod Ch**	**Pin**	**Sign**	**Pin**	**Sign**
	2				
		A7	NC	A7	NC
		B6	NC	B6	NC
		A2	NC	A2	NC
		B1	NC	B1	NC
		A11	NC	A11	NC
		A16	NC	A16	NC
		A20	NC	A20	NC
		B19	NC	B19	NC
		A19	NC	A19	NC
		B18	NC	B18	NC
		A18	NC	A18	NC
		B17	NC	B17	NC
		A17	NC	A17	NC
		B16	NC	B16	NC
		A15	NC	A15	NC
		B14	NC	B14	NC
		A14	NC	A14	NC
		B13	NC	B13	NC
		A13	NC	A13	NC
		B12	NC	B12	NC
		A12	NC	A12	NC
		B11	NC	B11	NC
		B15	NC	B15	NC
		B20	NC	B20	NC

5.2.4 Digital Output Signals

Check the LED indicators on the termination board, the I.S. Isolator module and the digital output board according to Table 5-11.

Table 5-11. Control of LED Indicators

I.S. Isolator Module		**Digital Output Board**		**Action**
Power on	**Ch**	**F**	**Ch**	
off	X	X	X	The fault is located in the Intrinsic Safety System
on	X	on	X	The fault is located in the Advant Controller 400 Series
on	off	off	on	Check the signal level on the input of the I.S. Isolator module (1) If > 17V: the fault is located in the Intrinsic Safety System If < 17V: the fault is located in the Advant Controller 400 Series
on	on	off	off	Check the signal level on the input of the I.S. Isolator module (1) If < 5V: the fault is located in the Intrinsic Safety System If > 5V: the fault is located in the Advant Controller 400 Series
on	off	off	off	Check the signal level on the output of the I.S. Isolator module (2) If on: fault in the Intrinsic Safety System If off: try to change to on and do check according to next column
on	on	off	on	Check the signal level on the output of the I.S. Isolator module (2)) If off: short circuit or fault in the Intrinsic Safety System If on: try to change to off and do check according to previous column

(1) The best point to measure the input signal to the I.S. Isolator module is to use the not used connectors on the Interface Adapter Card. To find the right pins see Table 5-12. Connect a voltmeter between the channel and U-.

(2) The output signals type is dependent of the I.S. Isolator module type.
Check of I.S. Isolator module see Instruction Manual for the I.S. Isolator module.

Table 5-12. Interface Adapter Card Connector pinning for DSDO 110/115

Ex i Module		**X1**		**X2**		**X3**	
Pos	**Mod Ch**	**Pin**	**Sign**	**Pin**	**Sign**	**Pin**	**Sign**
		B20	U1+	B5	U1+		
1	1	A20	CH1	A5	CH1		
	2	B19	CH2				
2	1	A19	CH3	B4	CH2		
	2	B18	CH4				
3	1	A18	CH5	A4	CH3		
	2	B17	CH6				
4	1	A17	CH7	B3	CH4		
	2	B16	CH8				
		A16	U1-				
		B15	U2+				
5	1	A15	CH9	A3	CH5		
	2	B14	CH10				
6	1	A14	11	B2	CH6		
	2	B13	12				
7	1	A13	13	A2	CH7		
	2	B12	14				
8	1	A12	15	B1	CH8		
	2	B11	16				
		A11	U2-	A1	U1-		
		B10	U3+			B5	U2+
9	1	A10	17			A5	CH9
	2	B9	18				
10	1	A9	19			B4	CH10
	2	B8	20				
11	1	A8	21			A4	CH11
	2	B7	22				
12	1	A7	23			B3	CH12

Table 5-12. Interface Adapter Card Connector pinning for DSDO 110/115 (Continued)

Ex i Module		**X1**		**X2**		**X3**	
Pos	**Mod Ch**	**Pin**	**Sign**	**Pin**	**Sign**	**Pin**	**Sign**
	2	B6	24				
	1	A6	U3-				
	2	B5	U4+				
13	1	A5	25			A3	CH13
	2	B4	26				
14	1	A4	27			B2	CH14
	2	B3	28				
15		A3	29			A2	CH15
		B2	30				
16		A2	31			B1	CH16
		B1	32				
		A1	U-			A1	U2-

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